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Van Valkenburg

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[54] **CAPILLARY BLOOD COLLECTOR AND METHOD**

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604/403

[58] **Field of Search** 128/763, 767; 604/317,
604/403; 141/331, 343; 248/94; 222/460-462

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,902,477	9/1975	Gerarde	604/403
4,024,857	5/1977	Blecher et al.	128/763
4,132,225	1/1979	Whattam	128/767
4,215,700	8/1980	Crouther et al.	128/763
4,411,163	10/1983	White	128/763
4,646,753	3/1987	Nugent	128/763
4,653,512	3/1987	Losada	128/763

FOREIGN PATENT DOCUMENTS

2183159 6/1987 United Kingdom 604/403

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[57] **ABSTRACT**

A capillary blood collector having a collection tube with a collar secured thereto. A bowl is provided with a capillary tube secured to the bowl bottom and communicating with an opening in the bottom of the bowl. A plurality of legs are attached to the bowl and extend downwardly therefrom. Each leg has a lower recess and an upper recess that are adapted to removably receive the collar. A method for collecting blood comprising lodging the collar in the lower recess of each leg, depositing blood in the bowl to gravity feed through the capillary tube into the collection tube, and removing the collar from within each lower recess and lodging the collar in the upper recess of each leg.

20 Claims, 3 Drawing Sheets

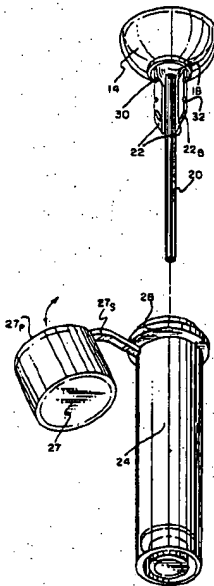


FIG. 1

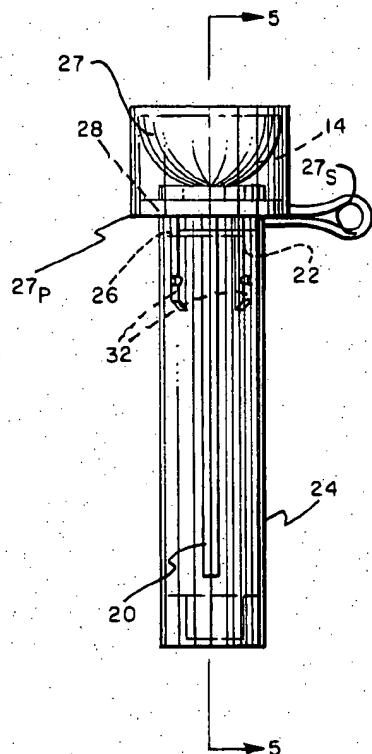
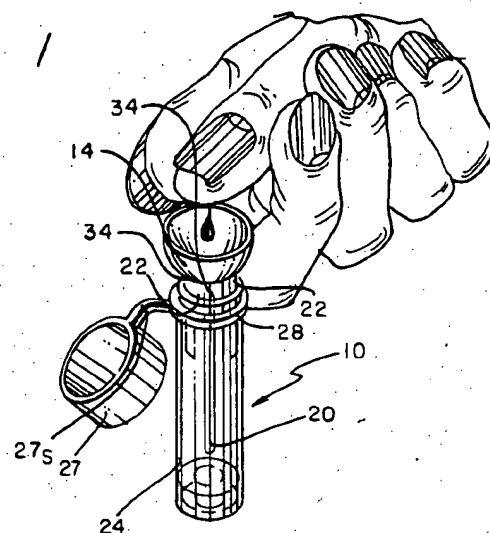


FIG. 2

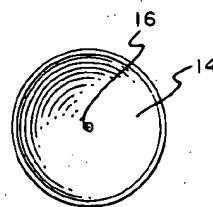


FIG. 3

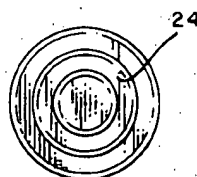


FIG. 4

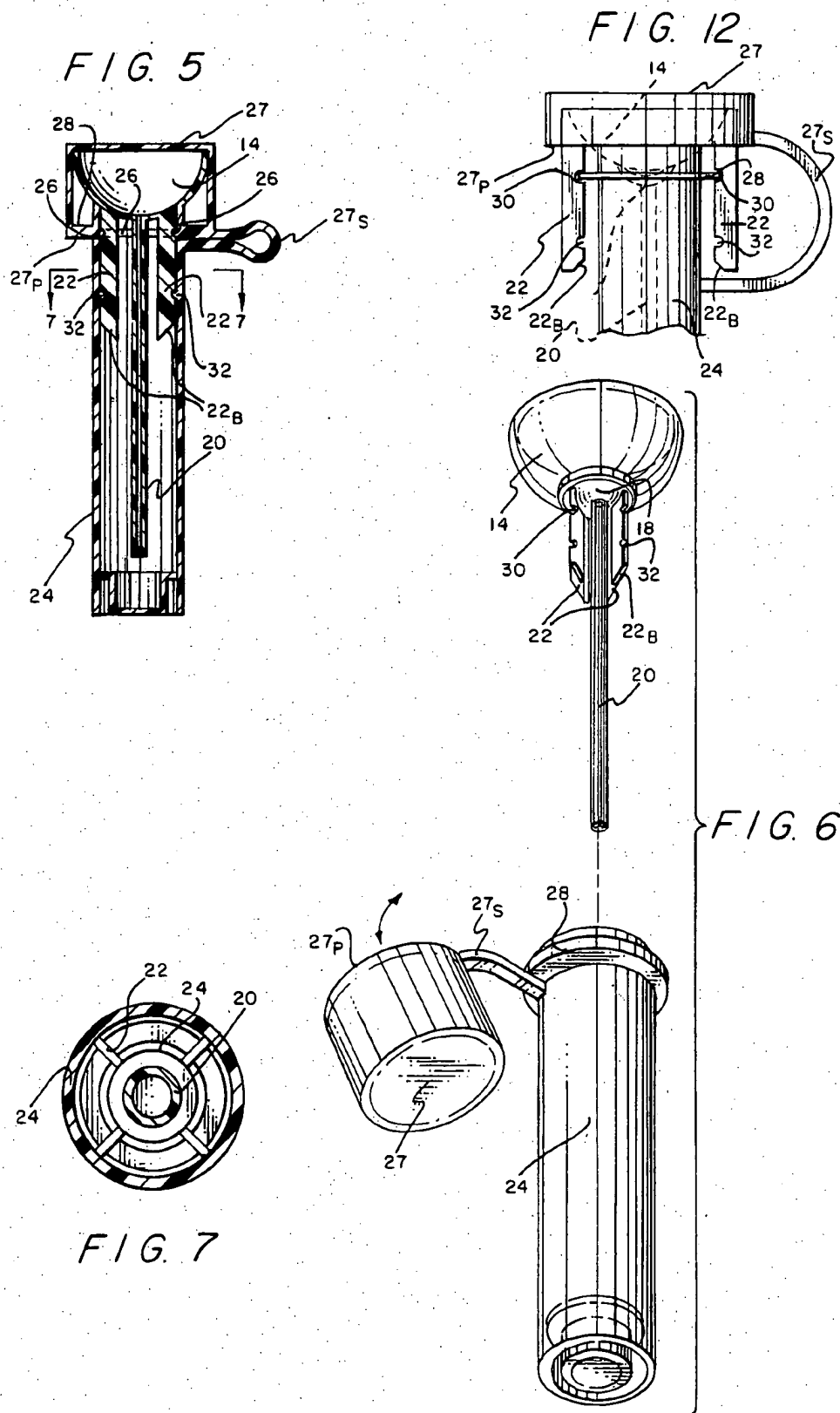


FIG. 8

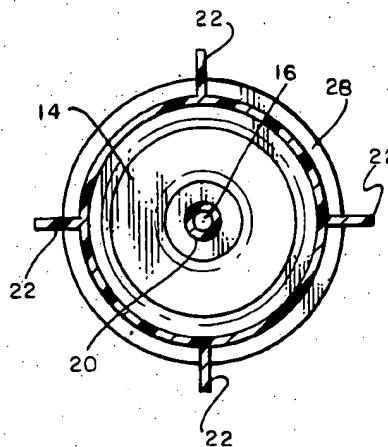
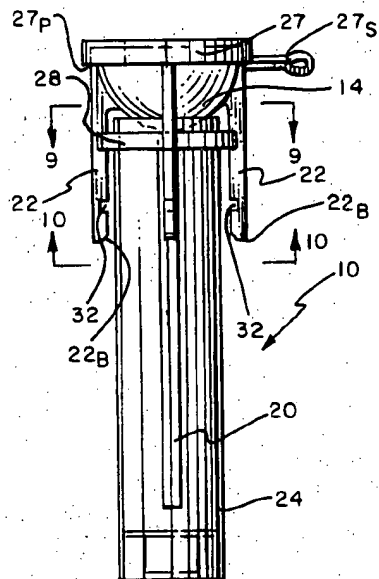


FIG. 9

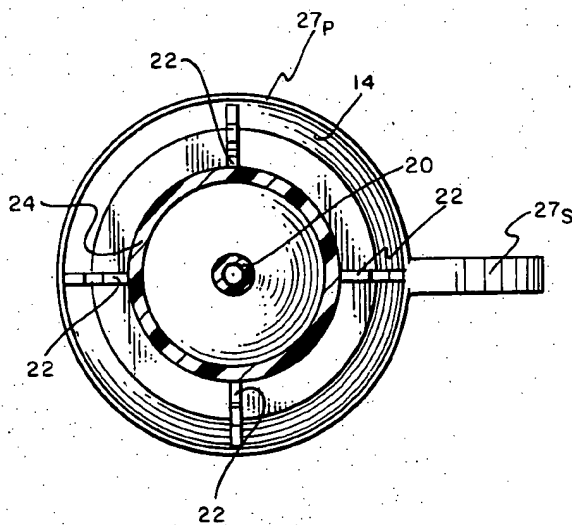
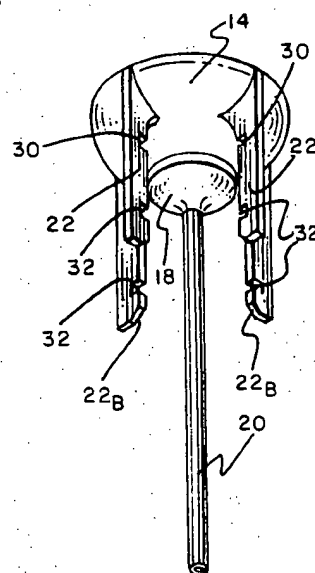


FIG. 10

FIG. 11



CAPILLARY BLOOD COLLECTOR AND METHOD

FIELD OF THE INVENTION

This invention is related to a capillary blood collector. More specifically, this invention provides a capillary blood collector to safely collect blood within a collection tube, and a method for collecting blood.

DESCRIPTION OF THE PRIOR ART

The following U.S. Patents by numbers were discovered in a patentability investigation: U.S. Pat. Nos. 4,646,753; 4,653,512; 4,411,163; 4,132,225; 4,215,700; and 4,024,857. None of the foregoing patents teach or suggest the particular capillary blood collector and method of this invention

SUMMARY OF THE INVENTION

The present invention broadly accomplishes its desired objects by providing for a capillary blood collector comprising a collection tube having a tube top. An inner collar is circumferentially disposed around the inside of the collection tube in proximity to the tube top. The capillary blood collector additionally comprises a bowl having a bowl bottom with a bowl opening; and a capillary tube secured to the bowl bottom and communicating with the bowl opening. At least one leg is supported by the bowl in a depending relationship. The leg has an inner leg face and an outer leg face. The leg also has a structure defining a lower recess, and an upper recess on the outer leg face. The leg removably connects to the inner collar of the collection tube such that the capillary tube extends into the collection tube and the bowl is supported in an elevated relationship above the collection tube.

The present invention further accomplishes its desired objects by broadly providing a capillary blood collector comprising a collection tube having a tube top. An outer collar is circumferentially disposed around the outside of the collection tube in proximity to the tube top. The capillary blood collector additionally comprises a bowl having a bowl bottom with a bowl opening; and a capillary tube secured to the bowl bottom and communicating with the bowl opening. At least one leg is supported by the bowl in a depending relationship. The leg has an inner leg face and an outer leg face, and a structure defining a lower recess and an upper recess on the inner leg face. The leg removably connects to the outer collar such that the capillary tube extends into the collection tube and is supported in an elevated relationship above the collection tube.

The present invention still further accomplished its desired objects by broadly providing a method for collecting blood comprising the steps of:

- (a) providing a collection tube having a collar secured thereto;
- (b) providing a bowl having a bowl bottom with a bowl opening and a capillary tube secured to the bowl bottom and communicating with the bowl opening, and at least one leg supported by the bowl in a depending relationship and the leg having a lower recess and an upper recess;
- (c) inserting the capillary tube into the collection tube;
- (d) positioning the collar in the lower recess of the leg;

(e) depositing blood into the bowl such that the blood flows through the bowl opening and through the capillary tube and into the collection tube; and

(f) removing the collar from the lower recess and positioning the collar into the upper recess of the leg.

It is therefore an object of the invention to provide for a capillary blood collector.

It is another object of the invention to provide for a method for collecting blood.

These, together with the various ancillary objects and features which become apparent to those skilled in the art as the following description proceeds, are attained by this novel capillary blood collector and process, a preferred embodiment being shown with reference to the accompanying drawings, by way of example only, wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of one embodiment of the capillary blood collector with the inner collar lodging in the lower recess of the legs lodging such that the bowl is in an elevated position to provide for an air space which allows the blood being deposited to flow by gravity through the capillary tube and into the collection tube;

FIG. 2 is a side elevational view of the embodiment of the capillary blood collector in FIG. 1 with the inner collar lodging in the upper recess of the legs such that the bottom of the bowl firmly seals the top of the collection tube and with the cap positioned over the top of the bowl.

FIG. 3 is a top plan view of the bowl;

FIG. 4 is a bottom plan view of the collection tube without the cap secured thereto;

FIG. 5 is a vertical sectional view in directional of the arrows and along the plane of line 5—5 in FIG. 2;

FIG. 6 is an exploded segmented perspective view of the embodiment of the capillary blood in FIGS. 1, 2 and 5;

FIG. 7 is a horizontal sectional view taken in direction of the arrows and along the plane of line 7—7 in FIG. 5;

FIG. 8 is a side elevational view of another embodiment of the capillary blood collector;

FIG. 9 is a horizontal sectional view taken in direction of the arrows and along the plane of line 9—9 in FIG. 8;

FIG. 10 is a horizontal section view taken in direction of the arrows and along the plane of line 10—10 in FIG. 8;

FIG. 11 is a perspective view of the bowl-capillary tube combination having the legs with recesses on the inside faces and connected to the bowl; and

FIG. 12 is a partial vertical side elevational view of the bowl-capillary tube combination having the upper recesses of the legs engaged to an outer collar mounted around the top of the collection tube with a cap flexible engaged to the collection tube and removably engaged to and over the top of bowl and upper part of the legs.

DETAILED DESCRIPTION OF THE INVENTION

Referring in detail now to the drawings wherein similar parts of the invention are identified by like reference numerals, there is seen a capillary blood collector, generally illustrated as 10, with two preferred embodiments respectively illustrated in FIG. 1-7 and 8-12. Both preferred embodiments comprise a bowl 14 with a

bowl opening 16 at the bottom of the bowl 14. The bowl 14 preferably (but now necessarily as shown in FIG. 5) is formed with a plate member 18 that has a plate opening (not shown in the drawings) that registers with the bowl opening 16. A tubular, hollow capillary member 20 connects to the bowl opening 16 such that the hollow capillary member 20 communicates with the bowl opening 16. Alternatively, as illustrated in FIG. 5, the hollow capillary member 20 connects directly to the bottom of the bowl 14 and around the bowl opening 16 such that the inside of the tubular hollow capillary member 20 communicates with the bowl opening 16. Both preferred embodiments of the invention also comprise a plurality of legs 22, and a collection tube or vial 24.

In the preferred embodiment for the capillary blood collector 10 in FIGS. 1-7, the legs 22 may either be connected to the plate member 18 (see FIG. 6) or to the outside bottom of the bowl 14 (See FIG. 5) when no plate member 18 has been used. For this embodiment of the invention, an inner collar 26 is disposed around the inside of the collection tube 24. Inner collar 26 protrudes away from the inside cylindrical wall of the collection tube 24. A cap 27 is formed with a perimeter 27p and with a flexible strap 27s which secures to the top of the side of the connection tube 24. An outer collar 28 may or may not be employed. If an outer collar 28 is used in the embodiment of the invention in FIGS. 1-7, the strap 27s secures to the side of the collection tube 24 underneath the outer collar 28 such that the structural perimeter 27p of the cap 27 can fit snugly around the outer collar 28. Each of the legs 22 have an upper recess 30 and a lower recess 32 on the outer face of the leg 22. The lower recess 32 and the upper recess 30 are for both removably receiving the protruding inner collar 26 therein.

In operation of the preferred embodiment for the capillary blood collector 10 in FIGS. 1-7, the legs 22 (along with the depending, hollow capillary tube 20) are inserted into the collection tube 24 until the inner collar 26 snaps into the lower recess 32 of each leg 22. Such a fitting supports the bowl 14 in an elevated position above the top opening of the collection tube 24 with a vent (or air opening) 34 between the outside bottom of the bowl 14 and the top opening of the collection tube 24 (See FIG. 1). When blood or any other fluid is deposited into the bowl 14, the vent opening 34 allows the blood (or other fluid) to flow through the bowl opening 16, through the hollow capillary tube 20 and into the bottom of the collection tube 24. After the desired quantity of blood (or other fluid) has been collected, the inner collar 26 is removed from within the lower recess 32 of each leg 32, such as by merely pushing down with force on top of the elevated bowl 14. The legs 22 are preferably manufactured of flexible material (e.g. polyethylene) in order to bend towards the axis of the capillary tube 20 when force is applied on top of the bowl 14. When the legs 22 bend accordingly, the inner collar 26 pops out of the lower recess 32 of each leg 22, allowing the freedom to insert the legs 22 (along with the depending, hollow capillary tube 20) further into the collection tube 24. Preferably, the legs 22 (and the depending capillary tube 20) are pushed all the way into the collection tube 24 until the inner collar 26 snaps into the upper recess 30 of each leg 22. The facilitate the passing of the bottom of each leg 22 over the inner collar 26 and the inward bending of each leg 22, each leg 22 has a beveled bottom 22b.

In a preferred embodiment of the invention, when the inner collar 26 is disposed within the upper recess 30 of each leg 22, the outside bottom of the bowl 14 snugly fits or seats around the top opening of the collection tube 24 (see FIG. 5) to firmly seal-off or shut-in the open top of the collection tube 24, thus preventing any of the enclosed fluid from flowing out. To further seal-off or shut-in the open top of the collection tube 24, the cap 27 is positioned over the open top of the bowl 14 and the perimeter 27p of the cap 27 is snapped over the perimeter of the outer collar 28 to fit snugly thereagainst (see FIG. 5). The cap 27 affords another means for enclosing and maintaining the fluid within the collection tube 24, thus preventing the remote possibility of fluid being spilled from the collection tube 24 by flowing out of the collection tube 24 through the hollow capillary tube 20 and the bowl opening 16. When it is desired to remove the fluid from the collection tube 24, the cap 27 is merely snapped off the perimeter of the outer collar 26, and the bowl 14 is grasped and pulled up forcefully to flex or bend the flexible legs 22 inwardly to dislodge the inner collar 26 from within the upper recess 30 of each leg 22, and from within the lower recess 32 of each leg 22 in the event the inner collar 26 comes to rest within the lower recess 32 of each leg 22 as the bowl 14 (along with the depending legs 22 and capillary tube 20) are being pulled upwardly.

In the preferred embodiment for the capillary blood collector 10 in FIGS. 8-12, the legs 22 are secured to the outside bottom of the bowl 14 such that the outside face of each leg 22 collimates with the structural perimeter that circumscribes the top opening of the bowl 14 (as illustrated in FIGS. 8, 11 and 12). The lower recess 32 and the upper recess 30 are formed on the inner face of each leg 22. The outer collar 28 is secured to the outside of the collection tube 24 in proximity to the top thereof and protrudes therefrom. The recesses 30 and 32 are for removably receiving the protruding outer collar 28 therein. The plate member 18 may or may not be employed (see FIGS. 8 and 10 where plate member 18 is not used and see FIG. 11 where plate member 18 is used). The flexible strap 27s of the cap 27 is either secured to the outside of the bowl 14 (see FIG. 8 and 10) or is secured to the outside of the collection tube 24 (see FIG. 12) and underneath the outer collar 28. The inner collar 26 may or may not be employed.

The operation of the preferred embodiment for the capillary blood collector 10 in FIGS. 8-12 is similar to that of FIGS. 1-7. More specifically, the depending capillary tube 20 is inserted into the inside the collection tube 24 with legs 22 passing over the outside of the collection tube 24 and over the outer collar 28. The legs 22 are flexible such as to bend slightly away from the axis of the capillary tube 20, enabling the legs 22 to flex outwardly and allowing the outer collar 28 to snap into the lower recess 32 of each leg 22 which would enable the bowl 14 to be supported in an elevated position above the top opening of the collection tube 24 with the vent 34 between the outside bottom of the bowl 14 and the top opening of the collection tube 24. To facilitate the passing of the bottom of each leg 22 over the outer collar 28 and the outward bending of each leg 22, each leg 22 has a beveled bottom 22b. After the desired quantity of fluid has been collected to the outer collar 28 is removed from within the lower recess 32 of each flexible leg 22 such as by merely pushing down with force on top of the elevated bowl 14. When the legs 22 bend outwardly, the outer collar 28 pops out of the lower

recess 32 of each flexible leg 22, permitting the capillary tube 20 to be inserted further into the collection tube 24 and allowing the legs 22 to be slid further down the outside of the outer collar 28 until the outer collar 28 snaps into the upper recess 30 of each flexible leg 22. In such a posture, the outside bottom of the bowl 14 snugly fits or seats around the top opening of the collection tube 24 (see FIGS. 8 and 12) to firmly seal-off or shut-in the open top of the collection tube 24. This prevents any of fluid contained within the collection tube 24 from flowing out. To seal-off the top of the bowl 14, the cap 27 is positioned over the open top of the bowl 14 and the perimeter 27p of the cap 27 is snapped over the structural perimeter of the top opening of the bowl 14 and over the top portion of the outer face of each leg 22 (see FIGS. 8 and 12). The cap 27 in such an enclosing position prevents the fluid within the collection tube 24, from leaving the collection tube 24 through the hollow capillary tube 24 and the bowl opening 16. When it is desired to remove the fluid from the collection tube 24, the cap 27 is snapped off the structural perimeter of the top opening of bowl 14 and off the top portion of the outer face of each leg 22, and the bowl 14 is firmly grasped and pulled upwardly with force to flex the legs 22 inwardly and to disengage the outer collar 28 from within the upper recess 30 of each leg 22 continual forceful pulling upwardly of the bowl 14 would also disengage the outer collar 28 from within the lower recess 32 of each leg 22 as the bowl 14 along the depending capillary tube 20 are being pulled upwardly.

While the present invention has been describe herein with reference to particular embodiments thereof, a latitude of modification, various changes and substitutions are intended in the foregoing disclosure, and it will be appreciated that in some instances some features of the invention will be employed without a corresponding use of other features without departing from the scope of the invention as set forth.

I claim:

1. A capillary blood collector comprising a collection tube having a tube top; an inner collar circumferentially disposed around the inside of said collection tube in proximity to said tube top;
 - a bowl having a level bottom with a bowl opening;
 - a capillary tube secured to said bowl bottom and communicating with said bowl opening;
 - at least one leg supported by said bowl in a depending relationship, said leg having an inner leg face and an outer leg face, said leg having a structure defining a lower recess and an upper recess on said outer leg face; and said leg removably connects to said inner collar such that said capillary tube extends into said collection tube.
2. The capillary blood collector of claim 1 wherein said upper recess removably receives the inner collar.
3. The capillary blood collector of claim 1 wherein said lower recess removably receives said inner collar.
4. The capillary blood collector of claim 2 additionally comprising a cap removably secured to the tube top.
5. The capillary blood collector of claim 2 additionally comprising a cap including a flexible strap bound to said collection tube such that said cap can be removably secured to said tube top and enclosed said bowl.
6. The capillary blood collector of claim 2 additionally comprising a cap including a flexible strap bound to said bowl such that said cap can be removably secured over said bowl.

7. The capillary blood collector of claim 5 additionally comprising an outer collar circumferentially disposed around the collection tube above where the flexible strap secures to said collection tube such that said cap can be removably secured around said outer collar and enclose said bowl.

8. The capillary blood collector of claim 2 wherein said leg is secured directly to said bowl and depends therefrom downwardly.

9. The capillary blood collector of claim 2 additionally comprising a bowl plate secured to said bowl on the outside thereof such that said capillary tube extends therethrough; and said leg is secured directly to said bowl plate and depends therefrom downwardly, and each of said legs has a beveled bottom.

10. The capillary blood collector of claim 2 comprising four legs radially disposed generally equidistantly apart.

11. A capillary blood collector comprising a collection tube having a tube top; an outer collar circumferentially disposed around the outside of said collection tube in proximity to said tube top;

- a bowl having a level bottom with a bowl opening;
- a capillary tube secured to said bowl bottom and communicating with said bowl opening;
- at least one leg supported by said bowl in a depending relationship, said leg having an inner leg face and an outer leg face, said leg having a structure defining a lower recess and an upper recess on said inner leg face, and said leg removably connects to the outer collar such that the capillary tube extends into the collection tube.

12. The capillary blood collector of claim 11 wherein said upper recess removably receives said outer collar.

13. The capillary blood collector of claim 11 wherein said lower recess removably receives said outer collar.

14. The capillary blood collector of claim 12 additionally comprising a cap removably secured to the tube top.

15. The capillary blood collector of claim 12 additionally comprising a cap including a flexible strap bound to said collection tube beneath said outer collar such that said cap can be removably secured around said leg and over said bowl to enclose the latter.

16. The capillary blood collector of claim 12 additionally comprising a cap including a flexible strap bound to said bowl such that said cap can be removably secured over said bowl.

17. The capillary blood collector of claim 12 wherein said leg is secured directly to said bowl and depends therefrom downwardly.

18. The capillary blood collector of claim 17 additionally comprising a bowl plate secured to said bowl on the outside thereof such that said capillary tube extends therethrough, and each of said legs has a beveled bottom.

19. The capillary blood collector of claim 12 comprising four legs radially disposed generally equidistantly apart.

20. A method for collecting blood comprising the steps of:

- (a) providing a collection tube having a collar secured thereto;
- (b) providing a bowl having a bowl bottom with a bowl opening and a capillary tube secured to said bowl bottom and communicating with said bowl opening, and at least one leg supported by said

bowl in a depending relationship and said leg having a lower recess and an upper recess;
(c) inserting said capillary tube into said collection tube;
(d) positioning said collar in said lower recess of said leg;
(e) depositing blood into said bowl such that the

blood flows through the bowl opening and through the capillary tube and into the collection tube; and
(f) removing said collar from said lower recess and positioning said collar into said upper recess of said leg.

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